FACULTY OF EDUCATION
SYLLABUS

Integrated Programme of
B.Sc.B.Ed. Degree (Four Year)
Annual Scheme
Academic Session 2019-20
Examination B.Sc B.Ed Part - I (2020)

Dy. Registrar (Academic-I)
University of Rajasthan
Jaipur
NOTICE

1. Change in syllabus/ordinance/rules/regulations/ syllabi and books may from time to time, be made by amendment or remaking and a candidate shall, accept in so far as the university determines otherwise comply with any change that applies to years he/she has not completed at time of change.

2. All court cases shall be subject to the jurisdiction of Rajasthan Univeristy head quarter Jaipur only and not any other place.

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B.Sc B.Ed PART - I

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Ordinance and Regulations related to the Integrated B.Sc.B.Ed. Degree

01. The Objective and the Learning outcomes of the Integrated B.Sc.B.Ed. Degree are:

Objectives:

1. To promote capabilities for inculcating national values and goals as mentioned in the constitution of India.
2. To act as agents of modernization and social change.
3. To promote social cohesion, international understanding and protection of human rights and right of the child.
4. To acquire competencies and skills needed for teacher.
5. To use competencies and skills needed for becoming an effective teacher.
6. To become competent and committed teacher.
7. To be sensitive about emerging issues such as environment, population general equality, legal literacy etc.
8. To inculcate logical, rational thinking and scientific temper among the students.
9. To develop critical awareness about the social issues & realities among the students.
10. To use managerial organizational and information & technological skills.

Learning outcomes:

1. Competence to teach effectively two school subjects at the Elementary & secondary levels.
2. Ability to translate objectives of secondary education in terms of specific Programmes and activities in relation to the curriculum.
3. Ability to understand children's needs, motives, growth pattern and the process of learning to stimulate learning and creative thinking to faster growth and development.
4. Ability to use-
5. Individualized instruction
6. Dynamic methods in large classes.
7. Ability to examine pupil's progress and effectiveness of their own teaching through the use of proper evaluation techniques.
8. Equipment for diagnosing pupil progress and effectiveness of their own teachings through the use of proper evaluation techniques.
9. Readiness to spot talented and gifted children and capacity to meet their needs.
10. Ability to organize various school programmes, activities for pupil.

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11. Developing guidance point of view in educational, personal and vocational matters.

12. Ability to access the all round development of pupils and to maintain a cumulative record.

13. Developing certain practical skill such as:
   a. Black board work
   b. Preparing improvised apparatus
   c. Preparing teaching aids and ICT.

14. Interest and competence in the development of the teaching profession and education. Readiness to participate in activities of professional organizations.

Integrated Programme of B.Sc.B.Ed. Degree Shall Consist of

i) First Year B.Sc.B.Ed.  
ii) Second Year B.Sc.B.Ed.  
iii) Third Year B.Sc.B.Ed.  
iv) Final Year B.Sc.B.Ed.

Duration of the Course - Four Years

Examinination after each session in theory papers

Scheme of Examination against each subject separately.

Compulsory Papers:

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>Gen. English</td>
</tr>
<tr>
<td>2nd Year</td>
<td>Gen. Hindi</td>
</tr>
<tr>
<td>3rd Year</td>
<td>Computer Application (ICT)</td>
</tr>
<tr>
<td>4th Year</td>
<td>Environmental Education</td>
</tr>
</tbody>
</table>

*ELIGIBILITY CRITERION ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.

Group – A: Subject Specialisation:

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>Instructional System &amp; Educational</td>
</tr>
<tr>
<td>2nd Year</td>
<td>Peace Education</td>
</tr>
<tr>
<td>3rd Year</td>
<td>Guidance and Counselling in School</td>
</tr>
<tr>
<td>4th Year</td>
<td>Physical Education &amp; Yoga</td>
</tr>
</tbody>
</table>

Group-B: Content of Science Subject: A Student has to opt PCB & PCM Group select any three optional subject (papers) from group B which two must be the school teaching subjects.

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<table>
<thead>
<tr>
<th>Subject</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Botany</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Zoology</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Physics</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Mathematics</td>
<td>I, II &amp; III</td>
</tr>
</tbody>
</table>

**Group C: Pedagogy of School Subject 08 A/B**

Pedagogy of School Subject IIIrd Year and IVth Year (candidate shall be required to offer any two papers from the following, for part-III & part-IV).

<table>
<thead>
<tr>
<th>Pedagogy of</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Pedagogy of Biology</td>
</tr>
<tr>
<td></td>
<td>Pedagogy of Physics</td>
</tr>
<tr>
<td></td>
<td>Pedagogy of Mathematics</td>
</tr>
<tr>
<td></td>
<td>Pedagogy of General Science</td>
</tr>
</tbody>
</table>

- In all the subjects the student has to study a minimum of 12 papers in 1st year, 12 Paper in IIInd Year, 12Paper in IIIrd Year and 7 Paper in IVth Year (Total 43 Papers).
- Each theory paper will carry 100 marks and content base paper 05, 06, 07 (G-B) will carry 150 marks. (With practical part). Distribution of marks in mathematics is according to their marking scheme in page no.7.

**Scheme of Instruction for B.Sc. B.Ed Courses**

Details of course and scheme of study, titles of the papers, duration etc. for B.Sc.B.Ed Course are provided in Tables given below:-

**Four Years Integrated Course**

**Scheme of B.Sc.B.Ed. Ist Year**

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.Sc.- B.Ed.</td>
<td>Gen. English(Compulsory)*</td>
<td>100</td>
</tr>
<tr>
<td>I</td>
<td>01</td>
<td></td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Practical</td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed.</td>
<td>Childhood and Growing Up</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>B.Sc.-B.Ed. Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Contemporary India and Education</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>04</td>
<td>Instructional System &amp; Educational Evaluation</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>B.Sc.B.Ed0 5, 06 &amp; 07</td>
<td>Content (Select any Three)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Chemistry(I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Botany (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Zoology(I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Physics (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Mathematics(I,II,III)</td>
<td>40+40+40</td>
<td>30</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

*ELIGIBILITY CRITERION ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.

Four Years Integrated Course
Scheme of B.Sc.B.Ed. IIInd Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B.Sc.-B.Ed. 01</td>
<td>Gen. Hindi (Compulsory)*</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed. 02</td>
<td>Knowledge and curriculum</td>
<td>80 20</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>B.Sc.-B.Ed. 03</td>
<td>Learning and Teaching</td>
<td>80 20</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>B.Sc.B.Ed0 4 (G-A)</td>
<td>Peace Education</td>
<td>80 20</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>B.Sc.B.Ed0 5, 06 &amp; 07</td>
<td>Content (Select any Three)</td>
<td>33+33+34 50</td>
<td>150</td>
</tr>
<tr>
<td>VI</td>
<td>B.Sc.B.Ed0 05</td>
<td>Chemistry(I,II,III)</td>
<td>33+33+34 50</td>
<td>150</td>
</tr>
<tr>
<td>VII</td>
<td>B.Sc.B.Ed0 07</td>
<td>Botany (I,II,III)</td>
<td>33+33+34 50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>B.Sc.B.Ed0 07 (G-B)</td>
<td>Zoology(I,II,III)</td>
<td>33+33+34 50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>B.Sc.B.Ed0 07 (G-B)</td>
<td>Physics (I,II,III)</td>
<td>33+33+34 50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>B.Sc.B.Ed0 07 (G-B)</td>
<td>Mathematics(I,II,III)</td>
<td>40+40+40 30</td>
<td>150</td>
</tr>
</tbody>
</table>

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7
| VIII | B.Sc. - B.Ed | OPEN AIR / SUPW CAMP | | | | |
|------|-------------|---------------------|---|---|---|
|      |             | 1. Community Service | 25 | | |
|      |             | 2. Survey (Based on | 25 | | |
|      |             | social and educational | | | |
|      |             | events) | | | |
|      |             | 3. Co-Curricular | 25 | | |
|      |             | Activities | | | |
|      |             | 4. Health and Social | 25 | | |
|      |             | awareness programme | | | |
|      |             | (DISASTER | | | |
|      |             | MANAGEMENT AND | | | |
|      |             | CLEANINESS) | | | |

*ELIGIBILITY CRITERION ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.*

**Four Years Integrated Course**

**Scheme of B.Sc.B.Ed. IIIrd Year**

| Theory Paper | Course Code | Title of the Paper | Evaluation | | |
|--------------|-------------|---------------------|------------|---|
|              |             |                     | External | Internal | Practical | Total |
| I            | B.Sc.- B.Ed. 01 | Information & Communication Technology (ICT) (Compulsory)* | 60 | - | 40 | 100 |
| II           | B.Sc.-B.Ed. 02 | Language Across the Curriculum | 80 | 20 | - | 100 |
| IV           | B.Sc.-B.Ed-04 (G-A) | Guidance and Counseling in School | 80 | 20 | - | 100 |
|              |              |                     |           | | | |
| V            | B.Sc.B.Ed05 | Content | | | |
| VI           | & 06 | (Select any Three) | | | |
| &            | & 07 | 1. Chemistry (I,II,III) | 33+33+34 | 50 | 150 |
| VII          | (G-B) | 2. Botany (I,II,III) | 33+33+34 | 50 | 150 |
|              |          | 3. Zoology (I,II,III) | 33+33+34 | 50 | 150 |
|              |          | 4. Physics (I,II,III) | 33+33+34 | 50 | 150 |
|              |          | 5. Mathematics (I,II,III) | 40+40+40 | 30 | 150 |
| VIII         | 08(a,b) | Pedagogy of a School Subject (part-3), Ist & IInd Year (candidate shall be required to offer any two papers from the following for part-3 & other for | 80 | 20 | - | 100 |

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### Practicum

<table>
<thead>
<tr>
<th>Special Training Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Micro Teaching</td>
</tr>
<tr>
<td>- Practice Lesson</td>
</tr>
<tr>
<td>- Observation Lesson</td>
</tr>
<tr>
<td>- Technology Based Lesson</td>
</tr>
<tr>
<td>- Criticism Lesson</td>
</tr>
<tr>
<td>- Attendance</td>
</tr>
</tbody>
</table>

/Seminar/ Workshop

<table>
<thead>
<tr>
<th>Final Lesson</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
</table>

*ELIGIBILITY CRITERION ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.*

## Four Years Integrated Course

### Scheme of B.Sc.B.Ed. IVth Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.Sc.-B.Ed.</td>
<td>Environmental</td>
<td>External: 100, Internal: -</td>
</tr>
<tr>
<td>I</td>
<td>01</td>
<td>Education (Compulsory)*</td>
<td>Practical: -, Total: 100</td>
</tr>
<tr>
<td></td>
<td>B.Sc.-B.Ed.</td>
<td>Creating and inclusive school</td>
<td>80, 20, -, 100</td>
</tr>
<tr>
<td>II</td>
<td>02</td>
<td>Understanding Disciplines and Subject</td>
<td>80, 20, -, 100</td>
</tr>
<tr>
<td>III</td>
<td>B.Sc-B.Ed.</td>
<td>Physical Education &amp; Yoga</td>
<td>80, 20, -, 100</td>
</tr>
<tr>
<td>IV</td>
<td>04(G-A)</td>
<td>Gender, School and Society</td>
<td>80, 20, -, 100</td>
</tr>
<tr>
<td>V</td>
<td>B.Sc.-B.Ed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**VI** B.Sc.-B.Ed. 06  | Assessment for Learning  | 80  | 20  | -  | 100  
---|---|---|---|---|
**VIII** B.Sc.-B.Ed. 08(a,b)  | Pedagogy of a School Subject (part-4), 1st & 2nd Year (candidate shall be required to offer any two papers from the following for part-3 & other for part-4).  
1. Chemistry  
2. Biology  
3. Physics  
4. Mathematics  
5. General Science  | 80  | 20  | -  | 100  
---|---|---|---|---|
**Practicum**  | 1. Practice teaching  
2. Block Teaching (Participation in School Activities Social Participation in Group)  
3. Report of any feature of school / case study/action research  
4. Criticism Lesson  | 50  | 20  | 10  | 100  
---|---|---|---|---|
Final Lesson  | 100  |  |  | 100  
---|---|---|---|---|
|  |  |  |  | 800  

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**Four Years Integrated Course**  
**Scheme of B.Sc.B.Ed.**

**Compulsory Papers**

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>Gen. English</td>
</tr>
<tr>
<td>II Year</td>
<td>Gen. Hindi</td>
</tr>
<tr>
<td>III Year</td>
<td>Computer Application (ICT)</td>
</tr>
<tr>
<td>IV Year</td>
<td>Environmental Education</td>
</tr>
</tbody>
</table>

**Compulsory Paper**

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
</table>
| 1st Year | 1. Childhood and Growing Up  
2. Contemporary India and Education |

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II\textsuperscript{nd} Year
3. Knowledge and curriculum
4. Learning and Teaching

III\textsuperscript{rd} Year
5. Language Across the Curriculum

IV\textsuperscript{th} Year
6. Creating an inclusive school
7. Understanding Disciplines and Subject
8. Gender, School and Society
9. Assessment for Learning

\textbf{Group - A: Subject Specialisation:}

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>I\textsuperscript{st} Year</td>
<td>Instructional System &amp; Educational</td>
</tr>
<tr>
<td>II\textsuperscript{nd} Year</td>
<td>Peace Education</td>
</tr>
<tr>
<td>III\textsuperscript{rd} Year</td>
<td>Guidance and Counselling in School</td>
</tr>
<tr>
<td>IV\textsuperscript{th} Year</td>
<td>Physical Education &amp; Yoga</td>
</tr>
</tbody>
</table>

\textbf{Group B: (PCB and PCM Group) (Select any three)}

1. Chemistry (I, II, III)
2. Botany (I, II, III)
3. Zoology (I, II, III)
4. Mathematics (I, II, III)
5. Physics (I, II, III)

\textbf{Group C: Pedagogy of School Subject 08 A/B: Pedagogy of a School Subject II\textsuperscript{rd} Year and IV\textsuperscript{th} Year (candidate shall be required to offer any two papers from the following, for part-III & part-IV).}

- Pedagogy of Chemistry
- Pedagogy of Biology
- Pedagogy of Physics
- Pedagogy of Mathematics
- Pedagogy of General Science

- In all the subjects the student has to study a minimum of 12 papers in 1\textsuperscript{st} year, 12 Paper in II\textsuperscript{nd} Year. 12 Paper in II\textsuperscript{rd} Year and 7 Paper in IV\textsuperscript{th} Year (Total 43 Papers).
- Each theory paper will carry 100 marks and content base paper 05, 06, 07 (G-B) will carry 150 marks. (With practical part). Distribution of marks in mathematics is according to their marking scheme in page no.7.

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Scheme of Instruction for B.Sc.B.Ed Courses

Details of courses and scheme of study, titles of the papers, duration etc. for B.Sc.B.Ed Courses are provided in Tables given below:

<table>
<thead>
<tr>
<th>Years</th>
<th>Papers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Year</td>
<td>12 Paper + Practical</td>
<td>600 + 150 = 750</td>
</tr>
<tr>
<td>II Year</td>
<td>12 Paper + Practical + Practicum</td>
<td>600 + 150 + 100 = 850</td>
</tr>
<tr>
<td>III Year</td>
<td>12 Paper + Practical + Practicum + Final Lesson</td>
<td>600 + 150 + 100 + 100 = 950</td>
</tr>
<tr>
<td>IV Year</td>
<td>7 Paper + Practical + Practicum + Final Lesson</td>
<td>600 + 100 + 100 = 800</td>
</tr>
<tr>
<td>Total</td>
<td>43 Papers</td>
<td>2400 + 550 + 200 + 200 = 3350</td>
</tr>
</tbody>
</table>

O. 321 The objectives of the practical work prescribed for the Integrated Programme of B.Sc.-B.Ed. Degree (Four Year) are as follows:

**PART II**

**Practical Work**

Objectives:

To develop the ability and self-confidence of pupil teachers:

1. To be conscious of sense of values and need for their inculcation in children through all available means including one's own personal life.
2. Possess a high sense of professional responsibility.
3. Develop resourcefulness, so as to make the best use of the situation available.
4. Appreciate and respect each child's individuality and treat him as independent and integrated personality.
5. Arouse the curiosity and interest of the pupils and secure their active participation in the educative process.
6. Develop in the pupil's capacity for thinking and working independently and guide the pupils to that end.
7. Organize and manage the class for teaching learning.
8. Appreciate the dynamic nature of the class situation and teaching techniques.
9. Define objectives of particular lessons and plan for their achievements.
10. Organize the prescribed subject- matter in relation to the needs, interest and abilities of the pupils.
11. Use the appropriate teaching methods and techniques.

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12. Prepare and use appropriate teaching aids, use of the black board and other apparatus and material properly.
13. Convey ideas in clear and concise language and in a logical manner for effective learning.
14. Undertake action research.
15. Give proper opportunity to gifted pupils and take proper care of the back-ward pupils.
16. Co-relate knowledge of the subject being taught with other subjects and with real life situations as and when possible.
17. Prepare and use assignments.
18. Evaluate pupil's progress.
19. Plan and organize co-curricular activities and participate in them.
20. Co-operates with school teachers and administrators and learns to maintain school records and registers.

Practical skill to teach the two school subjects offered under Theory papers VIII A/B and the following:
1. Observation of lesson delivered by experienced teachers and staff of the college.
2. Planning units and lessons.
3. Discussion of lesson plans, unit plans and lessons given (including criticism lesson)
4. Organization and participation in co-curricular activities.
5. Setting follows up assignment.
6. Evaluation in terms of educational objectives use of teachers made tests & administration of standardized tests.
7. Black-board work.
8. Practical work connected with school subjects.
10. Experimental and laboratory work in chemistry, botany, zoology, physics, and mathematics subjects of experimental and practical nature.
11. Study of the organization of work and activities in the school.
12. Observation and assistance in the health education programme.
13. Observation and assistance in the guidance programme.
15. Techniques of teaching in large classes.

O. 322 A candidate has to deliver at least 40 lessons (20 Lessons of one teaching subject in 3rd year & 20 Lessons of other teaching subject in 4th year) in a recognized school under the supervision of the staff of the college shall be eligible for admission to the examination for the degree of B.Sc.-B.Ed.

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Notes:-

i. Teaching subject means a subject offered by the candidate at his/her running B.Sc-B.Ed course either as a compulsory subject or as an optional subject provided that the candidate studied it for at least two years. Thus the qualifying subjects like General English, General Hindi, Education and Environment Education prescribed for running B.Sc-B.Ed course of the University or a subject dropped by candidates at the part I stage of the degree course shall not be treated as teaching subjects.

ii. Only such candidate shall be allowed to offer General Science for the B.Sc B.Ed Examination who had studied Chemistry and any one subject of life science i.e. Biology, Botany or Zoology.

O.323 No candidate shall be allowed to appear in the Integrated B.Sc/B.Ed examination I,II,III & IV Year unless he/she has attended (80% for all course work & practicum, and 90% for school internship)

O.324 The examination for Integrated B.Sc.-B.Ed. for Four Year shall be in two parts- part 1st comprising theory papers & part 2 practice of teaching in accordance with the scheme of examination laid down from time to time.

O.325 Candidates who fail in Integrated B.Sc-B.Ed examination in part 1or/ part 2 the theory of education may present themselves for re-examination there in at a subsequent examination without attending a further course at an affiliated training college.

Provided that a candidate who fails in any one of the theory papers and secures at least 48% marks in the aggregate of the remaining theory papers may be allowed to reappear in the examination in the immediately following year in the paper in which he/she fails only. He/she shall be declared to have passed if he secures minimum passing marks prescribed for the paper in which he appeared and shall be deemed to have secured minimum passing marks only prescribed for the paper (irrespective of the marks actually obtained by him) for the purpose of determining his division in accordance with the scheme of examination. The candidate shall have to repeat the whole examination in subsequent year in case he fails to clear the paper in which he failed.

O.326 Candidates who fail in the Integrated B.Sc-B.Ed. examination part 1 and part 2 only in the practice of teaching may appear in the practical examination in the subsequent year provided that they keep regular terms for four calendar months per year and give at least 40 lessons (20 in part 1 & 20 in part 2) supervised lessons.

O.326 A: A candidate who complete a regular course of study in accordance with the provision laid down in the ordinance, at an affiliated teacher's training college

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for four academic year but for good reasons fails to appear at the Integrated B.Sc-B.Ed. examination may be admitted to a subsequent examination as an Ex-student as defined in O.325 or O.326 Above.

O.326 B: No candidate shall be permitted to appear as an Ex-student at more than one subsequent examination. The Integrated B.Sc-B.Ed programme shall be of duration of four academic years, which can be completed in a maximum of five years from the date of admission to the Integrated B.Sc.-B.Ed. Degree.

**Regulation 42 :-**

**Scheme of Integrated B.ScB.Ed Four Year Examination**

The Integrated B.Sc-B.Ed. (Four years) will consist of the following components;

**Part I-** Main theory papers at B.Sc.B.Ed. I, In Integrated B.Sc.B.Ed I Paper nos. are 02, 03 & 04 in each session are of three hours carrying 100 marks (80 for theory + 20 for sessional) each. Compulsory paper* 01 of 100 marks and optional Paper 05, 06, 07 (G-B). in each session are three hours carrying 150 marks (100 marks theory + 50 marks practical). Distribution of marks in mathematics is according to their marking scheme in page no.7.

**Part II-** Practice Teaching - Micro Teaching, Internship, Practice Teaching of 20 weeks (10 at B.Sc.B.Ed Year III & 10 at B.Sc.B.Ed Year IV) Block Teaching. Criticism and Final Lesson in III & IV Year per teaching subject.

**Organization evaluation of practice teaching:**

1. Every candidate will teach at-least 40 lessons (20 in III Year & 20 in IV Year) during practice teaching session. At least ten lessons in each subject should be supervised.

2. 40 (20+20) lessons as desired in the syllabus should be completed as full period class room lesson. Micro teaching lesson to be used in addition to those 40 lessons for developing certain teaching skills.

3. A minimum of ten lessons in each subject will be supervised evaluated by the subject specialist or a team of specialists of the subjects.

4. By and large, the evaluation of the performance in the practical teaching will be based on the last ten lessons in the subject when the student has acquired some competence and skills of teaching.

5. The internal assessment in practice of teaching will be finalized by the principal with the help of members of the teaching staff and the same will be communicated to the university before the commencement of the practical each year.

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6. At Integrated B.Sc-B.Ed III Year each candidate should be prepared to teach one lesson at the final practical examination. At the Integrated B.Sc-B.Ed IV Year exam candidate should be prepared to teach two lessons (one in each subject). The external examiners may select at-least 10% of the candidates to deliver two lessons in Integrated B.Sc.B.Ed IV Year.

7. There will be a board of Examiners for the external examination for each college which will examine each candidate in at-least one lesson and a minimum of 15% in two lessons (one in each of the two subjects).

8. The board of Examination will consist of:
   (a) The principal of the college concerned.
   (b) A principal or a senior and experienced member of the teaching staff of another training college, affiliated to University of Rajasthan.
   (c) An external examiner from outside the University of Rajasthan or a senior member of the teaching staff of an affiliated training college.
   (d) The board as far as possible will represent Social science, language and science.

9. Approximately 50 lessons will be examined by the board each day.

Working out the result and awarding the division:

(1) A candidate in order to be declared successful at the Integrated B.Sc.B.Ed. I, II, III & IV Year Examination shall be required to pass separately in Part I (Theory) and Part II (Practice of Teaching).

(2) For a passing in Part I (Theory) a candidate shall be required to obtain at-least (a) 30 percent marks in each theory paper and sessionals (24 marks out of 80 and 6 marks out of 20); (b) 30% marks in each theory paper and sessional (11 marks out of 35 & 4 marks out of 15) (c) 36 percent marks in the aggregate of all the theory papers.

(3) For passing in Part II (school internship Practice of Teaching) a candidate shall be required to obtain separately at-least-
   ✦ 40 percent marks in the external examination.
   ✦ 40 percent marks in internal assessment.

(4) The successful candidates at Integrated B.Sc.B.Ed Four Year Examination obtaining total marks will be classified in three divisions and shall be assigned separately in theory and school internship Practice of teaching as follows:

<table>
<thead>
<tr>
<th>Division</th>
<th>Theory</th>
<th>Practice of Teaching</th>
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<tr>
<td>Dy. Registrar(Academic-I)</td>
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<td>University of Rajasthan</td>
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<td>Jaipur</td>
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</table>

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The practical work record shall be properly maintained by the college and may be made available for work satisfaction of external examiner in school internship (practice teaching), those are expected to submit a report regarding this separately.

**B.Sc. B.Ed. I YEAR-2019**

**GENERAL ENGLISH**

**Duration**: 3hrs.  
**Max. Marks**: 100  
**Minimum Pass Marks**: 36

The syllabus aims at achieving the following objectives:

1. Introducing students to phonetics and enabling them to consult dictionaries for correct pronunciation. (sounds and word stress)
2. Reinforcing selected components of grammar and usage.
4. Strengthening compositional skills in English for paragraph writing, CVs and job applications.

The Pattern of the Question Paper will be as follows:

**Unit A: Phonetics Symbols and Translation**  
(20 marks)

(10 periods)

I. Phonetic Symbols and Transcription of Words (05)
II. Translation of 5 Simple sentences from Hindi to English (05) from English to Hindi (05)
III. Translation of (05) Words from Hindi to English (2.5)  
From English to Hindi (2.5)

**Unit B: Grammar and Usage**  
(25 marks)

(10 periods)

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I. Elements of a Sentence (05)
II. Transformation of Sentence (05)
   a. Direct and Indirect Narration
   b. Active and Passive Voice
III. Modals (05)
IV. Tense (05)
IV. Punctuation of a Short Passage with 10 Punctuation Marks (05)
   (As discussed in Quirk and Greenbaum)

Unit C: Comprehension (25 marks)


Candidates will be required to answer 5 questions of two lines each to be answered out of 10 questions. There would be two questions from the prescribed text. (10)

Sujata Bhatt Voice of the Unwanted Girl
Ruskin Bond Night Train for Deoli
M.K.Gandhi The Birth of Khadi
J.L.Nehru A Tryst with Destiny
A.P.J. Abdul Kalam Vision for 2020

The candidates will be required to answer 5 questions from the given unseen passage. (10)

One vocabulary question of 10 words from the given passage. (5)

Unit D: Compositional Skills (30 marks)

(15 periods)

I. Letters-Formal and informal (10)
II. CV's Resume and job Applications and Report (10)
III. Paragraph Writing (10)

Recommended Reading

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Sasikumar, V, Dutta and Rajeevan, A Course in Listening and Speaking-I Foundation Books. 2005


Singh, R.P. Professional Communication. OUP. 2004

Judith, Leigh. C.Vs and Job Applications. OUP. 2004


Gunashakared. A Foundation English Course for Undergraduate Book I, CIEFL, Hyderabad.

Quirk and Greenbaum: A University Grammar of English Longman, 1973

**B.Sc.B.Ed PART - I - 02**

**Childhood and Growing up**

**Marks -100**

**Objectives:**
After completing the course the students will be able:-

1. To develop an understanding of the basic concepts, methods and principles of psychology.

2. To develop an understanding of the nature and process of development.

3. To understand the different periods of life with Psycho-Social Perspective.

4. To develop an understanding of the nature and process of learning in the context of various learning theories and factors.

5. To understand the critical role of learning Environment.

6. To acquaint them with various Psychological attribute of an individual.

7. To reflect on the changing roles of children in contemporary society.

**Unit I: Role of psychology to understand the child**

- Psychology: Meaning, nature & branches of psychology,
- Methods of psychology: case study and experimental, Edu. Psychology;
- Meaning, nature, scope, educational implication of psychology in new Era,
- Child psychology; meaning, concept

**Unit II: Multi dimensional development**

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• Growth and development- concept, stages principles, dimensions, Factors in influencing development- genetic, biological, environmental and physical

• Theories of development:
  a) Piaget's Vygotsky cognitive development
  b) Freud's psycho- sexual development
  c) Erikson's psycho social development
  d) Gesell's maturation theory

Unit 3: Child Growing up

• Childhood: Meaning, concept and characteristics, effects of family, schools, neighbourhood and community on development of a child

• Adolescence: meaning, concept, characteristics, effects of family, school, peer group, social climate and social media.

• Personality: concept and nature, theories of personality with special reference to (Garden Allport, Psycho analytical theory, Jung's Theory) assessment of personality

• Individual differences: concept, areas (With Special Educational needs-Concept) and educational implication.

• Stress: meaning, types consequences of stress and stress managment.

Unit 4: Learning to Learn

• Concept and beliefs about learning:-Defining misconception, Brain's role in learning

• Memory and forget, Behaviouristic learning theories (Thorndike, Skinner, Pavlov), Gestalt, Cognitive, Types of learning by Gagne.

• Motivation:-Concept and Maslow's Hierarchy need theory, Creating and maintaining a productive Classroom Environment-Dealing with misbehaviour

Unit 5: Psychological Attributes of an individual

• Intelligence - Meaning, Types of intelligence - Social, Emotional and Spiritual Intelligence, theory of intelligence, Gardner's Multi intelligence theory, Measurement of intelligence

• Creativity - Meaning, Components, ways of enhancing creativity, relation with intelligence and other factors, Measurement of creativity

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• Socialization - Process of Socialization - Group dynamics - Theory of Kurt Lewin's, Leadership and its styles (Kimble Young), social prejudice
• Mental Health - Common problems related to child - Attention deficit hyperactivity disorder (ADHD), depression, Learning disabilities, dealing with a problematic child.

Test and Assignment:-

• Class Test 10 Marks
• Project (Any one of the following) 10 Marks

1. Comparative study of developing pattern's of children with reference to different in SES.
2. Collecting and analyzing statistics on the girl child with reference to gender ratio.
3. Write the administration, scoring, interpretation and conclusion of any one test by psychological experiment on learning/memory/intelligence test.

References:

3. Arora, Dr. Saroj, Bhargava, Rajshri (2014). Bal Manovigyan, Rakhi Prakashan, Agra

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8. Helen Bee Denise Boyd, First Indian Reprint 2004. The Developing Child, Published by Pearson Education Pre. Ltd. Indian Branch Delhi, India

**B.Sc. B.Ed PART - I - 03**

**Contemporary India and Education**

**MARKS-100**

**Objectives:-**
After completing the course the students will be able to:

1. To promote reflective thinking among students about issues of education related to contemporary India.
2. To develop an understanding of the trends, issues and challenges faced by contemporary education in India.
3. To appreciate the developments in Indian education in the post independence era.
4. To understand the Commissions and committees on education constituted from time to time.
5. To understand issues and challenges of education and concern for the underprivileged section of the society.
6. To develop awareness about various innovation practices in education.
7. To develop and understanding of self teaching technical devices.
8. To understand the constitutional values and provisions for education.

**Course Content**

**Unit I  Education as an Evolving Concept**

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• Education: Meaning, concept and nature, Ancient to present education as an organized and institutionalized form, formal and state sponsored active


Unit – II: Issues and Challenges

• Diversity, Inequality, Marginalization:- Meaning, Concept, Levels with special reference to Individual, Region, Language, Caste, Gender.

• Role of education in multicultural and multilingual society for Equalization and Improvement of Marginalization groups.

• Hindrances of Education in India: Quality, Facilities, Access, Cost, Political unwillingness, Youth unsatisfaction, Moral Crisis.

Unit – III: Constitution and Education

• Study of the Preamble, fundamental rights and duties of citizens, Directive Principles for state and constitutional values of Indian Constitution.

• Constitutional provisions for education and role of education in fulfillment of the constitutional promise of Freedom, Equality Justice, Fraternity.

• Education and politics, Constitutional vision related to aims of education,

• Peace Education, Role of Education, School and Teachers as agents for Imparting Culture, Education and Development. Education and Industrialization.

Unit – IV: Programme and Policies


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• SSA, MLL, RMSA, CCE, Navodaya Vidyalaya, Kasturba Gandhi Balika Vidyalaya, Model School.

Unit – V: Innovative Practices
• Concept, Need of innovation in view of technological and social change, Obstacles in innovation, Role of Education in bringing innovations,
• Education through interactive mode of teaching: Computer, Internet, Tally and Video-Conferencing, Edu-set Smart Class Room
• Yoga Education, Life Skill Education, Education and Competence in life regarding Social inclusion.

Test and Assignments :-
1. Class Test 10 marks
2. Any one of the following: 10 marks
   • Debate or Organize a one day discussion on the topic related to the subject and submit a report.
   • Critical appraisal on the report or recommendations of any commission and committee.
   • Organize collage, Poster Making activity in your respective institution.
   • Collection of at least three handouts of related topics of the subject.

REFERENCES :-

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7. अग्निहोत्री, स्वीन्द्र : आधुनिक भारतीय शिक्षा समस्याएँ और समाधान, राजस्थान हिन्दी ग्रंथ अकादमी.


10. J.F. Brown: Educational Sociology


13. Keay, F.E.: Indian Education in Ancient and later Times

14. M.N. Srinivas: Social Change in Modern India


16. Mookerji, R.S: Ancient Indian Education


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26. अल्लेकर, अ.स. : भारतीय शिक्षा पद्धति।
27. ओड, एल. के. : शिक्षा के नूतन आयाम, राजस्थान हिंदी ग्रंथ अकादमी, जयपुर।
28. गुरुप्र, एस. गी एवं अलका गुप्ता : भारत में शिक्षा प्रणाली का विकास, शारदा पुस्तक प्रकाशन, इलाहाबाद।
29. रत्न, पारि ताल : भारतीय शिक्षा का इतिहास, आगरा।
30. जोशी, सुमना : भारत में शिक्षा प्रणाली का विकास एवं समस्याएं, शारदा पुस्तक भवन, इलाहाबाद।
31. लाल राम बिहारी : भारतीय शिक्षा और उसकी समस्याएं, स्टोनी पब्लिकेशन्स, मेरठ।
32. साधीन संदर्भ सामग्री पुस्तिका : महिला एवं बाल विकास विभाग, राज, सरकार, जयपुर।

B.Sc.B.EdPART-I-04
INSTRUCTIONAL SYSTEM AND EDUCATIONAL EVALUATION

Objectives: Marks: 100

This course will enable the student teacher to:

- Explain the need, importance and characteristics of educational evaluation.
- Describe the approaches to educational evaluation.
- Discuss the role of educational evaluation in Teaching - Learning Process.
- Explain the nature of tools and techniques of educational evaluation.
- Describe the need and importance of psychological testing,
- Explain the nature of learners' evaluation and need for continuous comprehensive educational evaluation in schools.

Unit I: Instructional System

- Educational Objectives and instructional objectives.
- Relationship between educational objectives and instructional objectives
- Classification of educational objectives (Cognitive, affective and psycho motor)
- Functioning of educational objectives

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- Usefulness of the taxonomical classification.

Unit II: Need, importance and characteristics
- Teaching Learning process and role of evaluation
- Need and importance of Evaluation
- Definition of Evaluation
- Evaluation, Assessment and Measurement.
- Characteristics of good evaluation.

Unit III: Approaches to Evaluation
- Formative evaluation and summative evaluation
- Difference between summative and formative evaluation
- External evaluation and internal evaluation, advantages and disadvantages,
- Norm referenced evaluation
- Criterion referenced evaluation.

Unit IV: Role of Evaluation in Teaching-Learning Process.
- The relationship between instructional objectives, entering behavior, learning experiences and Performance assessment.
- Diagnosis to overcome deficiency in learning.
- Importance of results of evaluation to students, teachers, institutions with special reference to help in determining the effectiveness of a course, programme and functioning of a school.

Unit V: Nature of tools and techniques of evaluation
- Nature of test and Purpose of testing with reference to:
  - Instructional purpose b) Guidance purpose c) Administrative purpose
- Administration of Test and Interpreting test result.
- Meaning of Norms, types of Norms, age, Grade, Percentile and standard score.
  4. Norms and interpretation of test scores.
- Concept of grade system. Absolute grading, comparative grading and its advantages and disadvantages.

Test and Assignments - 20 marks
One class Test - 10 marks

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Practical (any one) 10 marks
1. Develop a portfolio for assessment of 2 school students
2. Prepare an advanced tool for evaluation
4. Develop an achievement test and its blue print.

References:
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<tr>
<th>Scheme:</th>
<th>CHEMISTRY</th>
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<td>Max Marks: 150</td>
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<tr>
<td>Duration (hrs.)</td>
<td>Max. Marks</td>
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<tr>
<td>Paper I</td>
<td>3</td>
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<td>Paper-II</td>
<td>3</td>
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<td>Paper-III</td>
<td>3</td>
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<tr>
<td>Practical</td>
<td>5</td>
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<tr>
<td>Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 3 questions selecting at least one question from each unit.</td>
<td></td>
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</table>

CH-101 Paper I: Inorganic Chemistry
(2 hrs or 3 periods/week)

Unit-I
Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born Haber cycle; solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajans rules.

Metallic bond: free electron, valence bond and band theories.

Weak Interactions: Hydrogen bonding, vander Waals forces.

Unit-II
Covalent Bond: Valence bond theory and its limitations, directional and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH₃, H₂O⁺ SF₄, ClF₃, ICl₂, H₂O.

Molecular Orbital Theory: homonuclear and heteronuclear (CO and NO) diatomic molecules. Multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III
s-Block Elements: Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystem, an introduction to alkyls and aryls.

Periodicity of p-block elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron affinity, electronegativity, diagonal relationship, catenation.

UNIT-IV
Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher boranes, borazine, boronhydrides, fulerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.
Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Unit V
Nuclear Chemistry: Fundamental particles of nucleus (nucleons); Concept of nuclides and its representation; isotopes, isobars and isotones (with specific examples); Forces operating between nucleons (n-n, p-p, & n-p); Qualitative idea of stability of nucleus (n/p ratio).
Radiochemistry: Natural and artificial radioactivity; Radioactive disintegration series; Radioactive displacement law; Radioactivity decay rates; Half life and average life; Nuclear binding energy, mass defect and calculation of defect and binding energy; Nuclear reactions, Spallation, Nuclear fission and fusion.

CH-102 Paper II: Organic Chemistry
(2 hrs or 3 periods/week)

Unit I

Unit II
Relative and absolute configuration, sequence rules, D/L and R/S systems of nomenclature.
Geometric Isomerism: Determination of configuration of geometric isomers - cis/trans and E/Z systems of nomenclature. Geometric isomerism in oximes and allylic compounds.
Conformational Isomerism: Newman projection and Sawhorse formulae, Conformational analysis of ethane, n-butane, cyclohexane.

Unit III

Alkenes, Cycloalkenes, Dienes and Alkynes: Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. Regioselectivity in alcohol dehydration - the Saytzeff rule, Hoffmann elimination. Physical properties and relative stabilities.

Classification and Nomenclature of isolated, conjugated and cumulated dienes. Structure of alkenes and butadiene. Methods of formation, properties, Chemical reactions - 1,2- and 1,4-additions, Diels-Alder reaction and polymerization.

Structure and bonding in alkenes. Methods of formation. Chemical reactions - acidity of alkenes; mechanism of electrophilic and nucleophilic addition reactions; hydroboration-oxidation; metal-ammonia reduction, oxidation and polymerization.

**Unit IV**


Aromaticity: the Hückel rule, aromatic ions - three to eight members.


**Unit V**

Alkyl and Aryl Halides: Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides S₂ and S₈ reactions with energy profile diagrams.

Polyhalogen compounds: Chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl, allyl, vinyl and aryl halides.

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**CH-103 Paper III: Physical Chemistry**

(2 hrs. or 3 Periods/week)

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**UNIT I**

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs. Calculation of slopes, differentiation of functions like \( y = e^x \), \( e^{-x} \), \( x^n \), \( \sin x \) and \( \log x \); maxima and minima; partial differentiation and reciprocity relations. Integration of some useful/relevant functions; permutations and combinations, factorials, probability.

Liquid State: Intermolecular forces, structure of liquids (a qualitative description), structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell.
UNIT II
Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.
Critical Phenomenon: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.
Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquidification of gases (based on Joule-Thomson effect).

UNIT III
Solid State: Definition of space lattice, unit cell.
Defects in solids.

UNIT IV
Colloidal State: Definition of colloids, classification of colloids.
Solids in liquids (gels) properties - kinetic, optical and electrical, stability of colloids, protective action, Hardy-Schulze law, gold number.
Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

UNIT V
Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction, concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order, pseudo order, half-life and mean-life. Determination of the order of reactions - differential method, method of integration, method of half-life period and isolation method.
Radioactive decay as a first order phenomenon.
Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometry. Theories of chemical kinetics. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.
Simple collision theory based on hard sphere model (transition state theory, Born-Haber cycle). Expression for the rate constant bases on equilibrium constant and other aspects.

Practical: CH-104: Laboratory Course-I
(4 hrs or 6 periods/week)

INORGANIC CHEMISTRY
Separation and identification of six radicals (3 cations and 3 anions) in the given inorganic mixture including special combinations.

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32
ORGANIC CHEMISTRY

Laboratory Techniques
(a) Determination of melting point (naphthalene, benzoic acid, urea, etc.); boiling point (methanol, ethanol, cyclohexane, etc.); mixed melting point (urea-cinnamic acid, etc.).
(b) Crystallization of phthalic acid and benzoic acid from hot water, acetanilide from boiling water, naphthalene from ethanol etc.; sublimation of naphthalene, camphor, etc.

Qualitative Analysis

PHYSICAL CHEMISTRY

One of the following experiments should be given in the examination.

(i) Chemical Kinetics:
(a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
(b) To study the effect of acid strength on the hydrolysis of an ester.
(c) To compare the strengths of HCl and H2SO4 by studying the kinetics of hydrolysis of ethyl acetate.
(d) To study kinetically the reaction rate of decomposition of iodide by H2O2.

(ii) Viscosity, Surface Tension:
(a) To determine the viscosity/surface tension of a pure liquid (alcohol etc.) at room temperature (using the Ostwald viscometer/still-mometer).
(b) To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).
(c) To determine the percentage composition of a given mixture (non-interacting systems) by viscosity method.
(d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

(Instructions to the Examiners)
CHY 104: Chemistry Practical (Pass course)

Max. Marks: 50
Duration of Exam: 5 hrs.
Minimum Pass Marks: 18

Inorganic Chemistry
Ex. 1 Separation and identification of 3 cations and 3 anions in the mixture

Organic Chemistry
Ex. 2 Laboratory Techniques
Ex. 3 Qualitative Analysis
Detection of elements and detection of functional groups

Physical Chemistry
Ex. 4 Perform one of the experiments mentioned in the syllabus. 12
Ex. 5 Viva-voce 5
Ex. 6 Record 5

Total 50

33
BOTANY

Min. Pass Marks: 36
Paper I
Paper II
Paper III
Practical Min. Marks: 18
Duration of examination of each theory paper:
Duration of examination of practical’s:

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.

2. Q. No. 1 will have 18 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.

3. Each paper is divided into four units. There will be one question from each unit. These Q. No. 2 to 5 will have internal choice.
Paper-1

Cell Biology, Genetics and Plant Breeding

(2 hrs /week)

Unit-1

Cell organelles and Nuclear material: Ultrastructures and functions of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum). Chromatin structure & Chromosome organization: eukaryotic and prokaryotic. Chromosome morphology; specialized types of chromosomes (Sex chromosomes, lambrush Chromosome, Polytenic Chromosome); transposons.

Unit-2

Cell divisions: Cell cycle, mitosis: stages, structure and functions of spindle apparatus; anaphase chromosome movement; Meiosis: its different stages- Meiosis I, Meiosis II, synaptonemal complex, chiasmata formation and crossing over.

Basis of genetic material: Griffith’s transformation experiment and The Hershey and Chase blender experiment to demonstrate DNA as the genetic material. Concept of Gene: Neurospora genetics: one gene one enzyme hypothesis; An idea about Prokaryotic and eukaryotic structure of gene – operon concept, exons and introns.

Extra nuclear genome: mitochondrial and Chloroplast genome, plasmids; Chromosomal aberrations: Deletion, duplication, translocation, inversion, Aneuploidy and polyploidy.

Unit-3

Genetic inheritance: Mendel’s laws of inheritance and their exceptions; allelic (dominant and co-dominance, lethality) and non-allelic interactions (complementary genes and duplicate genes). Quantitative inheritance: grain color in wheat, corolla length in tabacom. Cytoplasmic inheritance: maternal influence, shell coiling in snails, Kappa particles in Paramaecium, Multiple allelism: ABO blood groups in men

Unit-4

Plant Breeding: Introduction and objectives of plant breeding; general methods of plant breeding- in self-pollinated, cross-pollinated and vegetatively propagated crop plants; introduction and acclimatization, selections, hybridizations, hybrid vigour and inbreeding depression. Role of mutation and polyploidy in plant breeding. Famous Indian and international plant breeders and their contribution. National and International agricultural research institutes.

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35
Plant breeding work done on wheat and rice in India, Green revolution.

Suggested Laboratory Exercises.

- Study of cell structure from Onion, *Hydrilla* and *Spirogyra*.
- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in *Lycopersicon*, *Cassia* and *Capsicum*.
- Study of electron microphotographs of eukaryotic cells for various cell organization.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and Test cross.
- Permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Emasculation, bagging & tagging techniques.
- Cross pollination techniques.

Suggested Readings:

Paper 11

Microbiology, Mycology and Plant Pathology

(2 hrs/week)

Unit-1

Microbiology: Meaning and Scope, history and development in the field of microbiology, Concept of quorum sensing and biofilm

Eubacteria: general account, occurrence, morphology (structure, shapes), flagellation, nutritional types, endospore, reproduction (binary fission, transformation, conjugation, transduction), economic and biological importance.

Mycoplasma: occurrence, morphology, reproduction and importance.

Unit-2

Virus: General characteristics and importance. Structure of TMV and Pox virus. Structure and multiplication of Bacteriophage.

Fungi: General characters, occurrence, thallus organization, reproduction, economic importance. Classification of fungi (Alexopoulos and Ainsworth's).

Plant diseases: Biotic and abiotic diseases, important symptoms caused by fungi, bacteria, viruses and MLOs (blights, mildews, downy and powdery, rusts, smuts, canker, mosaic, little leaf, galls etc.).

Unit-3

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Albugo and white rust; Sclerospora and Downy mildew; Green ear disease of Bajra; Ascochyta Cicer aesculenta and Ergot; Peziza.

Unit-4

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Puccinia and Black rust of wheat; Ustilago and loose smut of wheat and covered smut of barley; Agericnus Alternaria and early blight of potato

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram's staining of bacteria.

2. Study of Mycoplasma, TMV, Pox virus, bacteriophage (photographs/ 3-D models)


5. Media preparation: potato dextrose agar, nutrient agar

6. Culture techniques of fungi and bacteria.

Suggested Books:


*Vashishtha, B.R. Botany for Degree Students - Fungi, S. Chand & Co., New Delhi, 2001.*


*Sharma, P. D.: Microbiology and Pathology, Rastogi Publication, Meerut, 2003.*


Paper III
Algae, Lichens and Bryophyta
(2 hrs/week)

Unit-1

Unit-2
Type Studies
Cyanophyceae - Oscillatoria, Nostoc
Chlorophyceae - Volvox, Chara
Xanthophyceae - Vaucheria
Phaeophyceae - Ectocarpus
Rhodophyceae - Polysiphonia

Unit-3
General characters, Origin, and evolution of Bryophyta. Classification (Eichler); Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.
Type Studies: Hepaticopsida - Riccia, Marchantia

Unit-4
Type Studies: Anthocerotopsida - Anthoceros; Bryopsida - Funaria
Lichens: General characters, habitat, structure, reproduction and economic and ecological importance of lichens.

Suggested Laboratory Exercises
1. Study of class work material by making suitable temporary slides and study of permanent slides of:
   Oscillatoria, Nostoc, Volvox, Chara, Vaucheria, Ectocarpus, Polysiphonia.
2. Study of external morphology and preparation of suitable sections of vegetative/reproductive parts of Riccia, Marchantia, Anthoceros, Funaria.
Suggested Readings


### Botany Practical Examination B. Sc Part-I

#### Skeleton Paper

M.M. 50

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Practical</th>
<th>Time (min)</th>
<th>MCQ (Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Prepare the acetocarmine stained slide of the material “A” provided to you. Draw a well labelled diagram of any one stage of nuclear division. Identify it giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1(b)</td>
<td>Comment and solve the problem on Genetics allotted to you along with reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Make suitably stained glycerine-preparation of any one alga from the given mixture “B”. Draw its labelled diagrams; assign it to its systematic position giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Make suitable preparation of the reproductive structure of material “C” (Fungi). Draw labelled diagrams, Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Make suitable stained preparation of material “D” (Bryophyta (vegetative/reproductive). Draw labelled diagrams. Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>One Microbiology experiment for comments. Or Gram’s staining.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Comment upon spots (1-5)</td>
<td>10</td>
<td></td>
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<tr>
<td>7</td>
<td>Viva-Voce</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Practical record</td>
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**Total:** 50 / 50
ZOOLOGY
B.Sc.-B.Ed.(Part-I) 2020

Scheme:
Max. Marks: 100
Min. Pass Marks: 36

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration</th>
<th>Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>3 Hrs</td>
<td>33</td>
</tr>
<tr>
<td>II</td>
<td>3 Hrs</td>
<td>33</td>
</tr>
<tr>
<td>III</td>
<td>3 Hrs</td>
<td>34</td>
</tr>
<tr>
<td>Practicals</td>
<td>4 Hrs.</td>
<td>50</td>
</tr>
</tbody>
</table>

NOTE:
1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering the entire syllabus.
   Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

PAPER – I: Z-101
DIVERSITY OF ANIMALS
Section – A

Biosystematics and Taxonomy
1. General principles of taxonomy, concept of five kingdom scheme, international code of nomenclature, cladistics, molecular taxonomy.
2. Concept of Protozoa and Metazoa, and levels of organization.
4. Detailed classification of Non-chordata and Chordata (up to suborders with examples).

Section – B

Note: * indicates wherever required

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2. Nucleic Acids:
   (i) DNA structure, polymorphism (A, B and Z types) and replication (semi
       conservative mechanism) experiments of Messelson and Stahl: elementary idea
       about polymerases, topoisomerases, single strand binding proteins, replicating
       forks (both unidirectional and bidirectional), leading and lagging strands, RNA
       primers and Okazaki fragments, elementary idea about DNA repair.
   (ii) RNA structure and types (mRNA, rRNA and tRNA) and transcription.

3. Genetic code and translation: Triplet code, characteristics of triplet code, protein
   synthesis (translation).

4. Cell in reproduction:
   (i) Interphase nucleus and cell cycle: S, G-1, G-2 and M phase.
   (ii) Mitosis: Different stages, structure and function of spindle apparatus;
       anaphasic movement.
   (iii) Meiosis: Different stages, synapses and synaptonemal complex, formation of
       chiasmata and significance of crossing over.

Section – C

Genetics
1. Mendelism: Brief history of genetics and Mendel’s work; Mendelian laws, their
   significance and current status, chromosomal theory of inheritance.
2. Chromosomal mutations: Classification, translocation, inversion, deletion and
   duplication; Variations in chromosome numbers; haploid, diploid, polyploid, aneuploid,
   euploid and polysony.
3. Linkage and crossing over, elementary idea of chromosome mapping.
4. Genetic interaction: Supplementary genes, complementary genes, duplicate genes,
   epistasis, inhibitory and polymorphic genes.
5. Multiple gene inheritance: ABO blood groups and Rh factor and their significance.
6. Cytoplasmic inheritance.
7. Sex determination in Drosophila and man, pedigree analysis.
8. Genetic disorders: Down’s, Turner’s and Klinefelter’s syndromes, color blindness,
   Hemophilia, Phenylketonuria.

PAPER – III: Z-103
GAMETE AND DEVELOPMENTAL BIOLOGY
Section – A

Developmental Biology: Scope and Early Events
1. Historical review, types and scope of embryology.
2. Gametogenesis:
   (i) Formation of ova and sperm.
   (ii) Vitellogenesis.
3. Fertilization: Activation of ovum, essence of activation: Changes in the organization
   of the egg cytoplasm.
4. Parthenogenesis.
Section – B

Developmental Biology: Pattern and Processes
1. Cleavage: Definition, planes and patterns of cleavage among non chordates and chordates, significance of cleavage, blastulation and morulation.
2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction, primary organizer, differentiation and competence.
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:
   (i) Extra embryonic membranes in chick, their development and functions.
   (ii) Placenta in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.
   (iii) Paedogenesis and neoteny.

Section – C

Dimensions in Developmental Biology
1. Regeneration.
2. Various types of stem cells and their applications.
3. Cloning of animals:
   (i) Nuclear transfer technique.
   (ii) Embryo transfer technique.
4. Teratogenesis (Genetic and Induced).
5. Biology of aging.

B.Sc.-B.Ed. (Part-I) 2020
Practical – Zoology

Min. Marks: 18
4 Hrs. / Week
Max. Marks: 50

I. Microscopic Techniques:
2. General methods of microscopic slide preparations: Nucleo, fixation, fixing and preservation, washing, staining, destaining, dehydrating, clearing and mounting.
3. General idea of composition, preparation and use of:
   (i) Fixatives: Formalin, Bouin’s fluid.
   (iii) Common reagents: Normal saline, Acid water, Acid alcohol and Mayer’s albumin.
4. Collection and Culture Methods:
   (i) Collection of animals from their natural habitat during field trips such as Amoeba, Paramecium, Euglena, Daphnia, Cyclops, etc.
   (ii) Culture of Paramecium in the laboratory and study of its structure, life processes and behavior in live state.

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II. Study of Microscopic Slides and Museum Specimens:

Protozoa: Amoeba, Euglena, Trypanosoma, Giardia, Entamoeba, Elphidium (Polystomella), Foraminiferous shells, Monocystis, Plasmodium, Paramecium, leishmania, Paramecium showing binary fission and conjugation, Ophalina, Nyclothtera, Balantidium, Vorticella.


Coelenterata: Millepora, Physalia, Velella, Aurelia, Alcyonium, Gorgonia, Pennatula, Sea anemone, Stone corals, Obelia colony and medusa.

Ctenophora: Any Ctenophore

Platyhelminthes: Taenia, Planaria, Fasciola (WM), T. S. body of Fasciola, Miracidium, Sporocyst, Redia and Cercaria Larvae of Fasciola, Scolex, T. S. mature proglottid of Taenia, gravid proglottid, Cysticercus larva.

Aschelminthes: Ascaris, Wuchereria, Dracunculus

Annelida: Neries, Heteroneres, Arenicola, Aphrodite, Chaetopterus, Tubifex, Glossiphonia, Pontobdella, Polygordius.

III. Anatomy:

Earthworm: External features, general viscera, alimentary canal, reproductive system and nervous system.

Leech: External features, alimentary canal, reproductive and nervous system.

IV. Study of the Following Through Permanent Slide Preparation: Paramecium, Euglena, Foraminiferous shells, Sponge spicules, Spongion fibres, Gemmule, Hydra, Obelia colony and Medusa; Parapodium of Nereis and Heteroneres.

V. Exercises in Cell Biology:

1. Squash preparation for the study of mitosis in onion root tip, permanent slides of mitosis (all stages).
2. Squash preparation for the study of meiosis in grasshopper or cockroach testes, permanent slice of meiosis (all stages).
3. Study of giant chromosomes in salivary glands of Chironomous or Drosophila larva.
4. Study of cell permeability using mammalian R.B.C.

VI. Exercises in Genetics:

A. Study of Drosophila:
1. Life cycle and an idea about its culture
2. Identification of male and female
3. Identification of wild and mutants (yellow body, ebony, vestigial wing and white eye)
4. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.

B. Numerical problems based on monohybrid and dihybrid cross.

C. Identification of blood groups (A, B, AB, O & Rh factor)

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VII. Developmental Biology:
1. Study of development of frog/toad with the help of Charts/Slides/Models:
   (i) Eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet / froglet.
   (ii) Histological slides: Cleavage, blastula, gastrula, neurula and tail-bud stage.
2. Study of development of chick with the help of whole mounts/Charts/Slides/Models
   (i) 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.
   (ii) Primitive streak stage in living embryo, if possible, after removal of the blastoderm from the egg.
   (iii) Study of the embryo at various stages of incubation in vivo by making a window in the egg-shell may also be demonstrated.
   (iv) Study of various foetal membranes in a 10-12 day old chick embryo.

B.Sc.-B.Ed. Part - I

Scheme of Practical Examination and Distribution of Marks

<table>
<thead>
<tr>
<th>Time: 4 Hrs.</th>
<th>Min Pass Marks: 18</th>
<th>Max. Marks: 50</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular</td>
<td>Ex./N.C. Students</td>
</tr>
<tr>
<td>1. Anatomy (any system)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>3. Cell Biology and Genetics</td>
<td>4+4</td>
<td>6+6</td>
</tr>
<tr>
<td>4. Developmental Biology</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5. Identification and comments on Spots (1 to 8)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>6. Viva Voce</td>
<td>5</td>
<td>5</td>
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<tr>
<td>7. Class Record</td>
<td>5</td>
<td>-</td>
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<tr>
<td></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

Notes:
1. Anatomy: Study of systems of the prescribed types with the help of dissection.
2. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams / photographs.
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
6. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

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B.Sc. Part I (Pass Course)

1. PHYSICS  
Max. Marks: 100

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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</thead>
<tbody>
<tr>
<td>Paper I</td>
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<td>33</td>
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<tr>
<td>Paper II</td>
<td>3 hrs. duration</td>
<td>33</td>
<td>12</td>
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<tr>
<td>Paper III</td>
<td>3 hrs. duration</td>
<td>34</td>
<td>12</td>
</tr>
<tr>
<td>Practical</td>
<td>5 hrs. duration</td>
<td>50</td>
<td>18</td>
</tr>
</tbody>
</table>

Paper-I: Mechanics & Oscillations

Work Load: 2 hrs. Lecture / week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising brief parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit - I:

Physical Law and frame of Reference
(a) Inertial and non-inertial frames, Transformation of displacement, velocity, acceleration between different frames of reference involving translation.
Galilean transformation and invariance of Newton’s laws.
(b) Coriolis Force: Transformation of displacement, velocity and acceleration between rotating frame, Pseudo forces, Coriolis force, Motion relative to earth, Foucukt’s pendulum.
(c) Conservative Forces: Introduction about conservative and non-conservative forces, Rectilinear motion under conservative forces, Discussion of potential energy and motion of a particle.

Unit - II:

Centre of Mass
Introduction about Centre of Mass, Centre of Mass Frame: Collision of two particles in one and two dimensions (elastic and inelastic), Slowing down of neutrons in a moderator, Motion of a system with varying mass, Angular momentum concept, conservation and charge particle scattering by a nucleus.

Rigid body.
Equation of motion of a rotating body, Inertial coefficient, Case of J not parallel to w. Kinetic energy of rotation and idea of principal axes. Precessional motion of a spinning top.

Unit IV:

Motion under Central Forces
Introduction about Central Forces, Motion under central forces, Gravitational interaction, inertia and gravitational mass, General solution under gravitational interaction. Kepler's laws, Discussion of trajectories, Cases of elliptical and circular orbits, Rutherford scattering.

Damped Harmonic Oscillations
Introduction about oscillations in a potential well, Damped force and motion under damping. Damped Simple Harmonic Oscillator, Power dissipation, Anharmonic oscillator and simple pendulum as an example.

Driven Harmonic Oscillations
Driven harmonic oscillator with damping, Frequency response, Phase factor, Resonance, Series and parallel of LCR circuit, Electromechanical devices, Solar Calvanometer.

Coupled Oscillations
Equation of motion of two coupled Simple Harmonic Oscillators, Normal modes, motion in mixed modes, Transient behavior, Dynamics of a number of oscillators with neighbor interactions.

Text books:
- Mechanics (SI), Charles, Kavel
- Introduction to Classical Mechanics, TMH
- The Physics of Waves & Oscillations, Bajaj

Paper II (Electromagnetism)

*Work Load: 2 hrs. Lectures/week*

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with an answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

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Unit I: Scalar and Vector Fields
Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical
significance and formalism of Gradient, Divergence and Curl of a vector field
Cartesian co-ordinates system, Problems based on Gradient, Divergence and curl
operators. Concept of Solid angle, Gauss divergence and Stoke's theorem. Gauss law
from inverse square law. Differentiation of Gauss law.

Electric Field and Potential Energy
Invariance of Charge, Potential energy of system of (i) Discrete N-charges (ii)
Continuous charge distribution. Energy required to build a uniformly charged sphere,
classical radius of electron, Electric field due to a short electric dipole, Interaction of
electric dipole with external uniform and non uniform electric field, potential due to a
uniformly charged spherical shell.

Poisson’s and Laplace equations in Cartesian co-ordinates and their applications to
solve the problems of electrostatics.

Electric field measured in moving frames, Electric field of a point charge moving
with constant velocity.

Unit II: Electric field in matter
Multipole expansion, definition of moments of charge distribution, Dielectrics,
Induced dipole moments, polar non polar molecules, Free and bound charges,
Polarization, Atomic polarizability, electric displacement vector, electric
susceptibility, dielectric constant, relation between them.

Electric potential and electric field due to a uniformly polarized sphere (i) out side the
sphere (ii) at the surface of the sphere (iii) inside the sphere, Electric field due to a
dielectric sphere placed in a uniform electric field (a) out side the sphere (b) inside the
sphere, Electric field due to a charge placed in dielectric medium and Gauss law,
Clausius-Mossotti relation in dielectrics.

Unit III: Magnetostatics and Magnetic field in matter
Lorentz force, properties of magnetic field, Ampere's law, field due to a current
carrying solid conducting cylinder (a) out side (b) at the surface and (ii) inside the
cylinder. Ampere's law in differential form, Introduction of Magnetic Vector
potential, Poisson's equation for vector potential, Deduction of Bio-Savart law using
Magnetic Vector potentials, Differential form of Ampere's law.

Atomic magnet, Gyromagnetic ratio, Bohr-magneton, Larmor frequency, induced
magnetic moment and dia-magnetism, spin magnetic moment, para and ferromagnetism, Intensity of Magnetization, Magnetic permeability and Susceptibility, free
and bound current densities, Magnetic field due to a uniformly magnetized material
and Non-uniformly magnetized material.

Unit IV: Maxwell's Equations and Electromagnetic waves
Displacement current, Maxwell's Equations, Electromagnetic waves, Electromagnetic
waves in an Isotropic medium, Properties of electromagnetic waves, Energy density
of Electromagnetic waves, Pointing vector, Radiation pressure of free space,
Electromagnetic waves in Dispersive medium, Spectrum of Electromagnetic waves.

References:
2. Introduction to Electrodynamics ; David J. Griffith, Prentice Hall
4. Fundamental University Physics Vol II : Fields and Waves ; M. Alonso and E.J.
   Finn; Addison-Wesley Publishing Company.
Paper III

OPTICS

Work Load: 2 hrs. Lecture/week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six sets of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fourth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of every question shall be compulsory and Part (B) of these questions will have internal choice.

Unit – 1 Interference:
Concept of Spatial and Temporal Coherence, coherence length, coherence time, Definition and propagation of a wave front Huygen's principle of secondary wavelets, Young's Double slit experiment. Types of interference, interference by division of wavefront: Fresnel's Biprism. Measurement of wavelength \( \lambda \) and thickness of a thin transparent sheet. Interference by division of amplitude: Interference in thin films of constant thickness in transmitted and reflected waves. Interference produced by a wedge shaped film, Newton's rings, Determination of wavelength \( \lambda \) and refractive index \( \mu \) by Newton's Rings: fringes of equal inclination (Haidinger fringes) and equal thickness (Fizeau fringes), Michelson's Interferometer, shape of fringes, Measurement of wavelength, difference between two spectral lines and thickness of a thin transparent sheet.

Unit – 2 Diffraction:
Fresnel's diffraction, Half period zones. Fresnel's diffraction at a circular aperture, slit and a rectangular slit. Zone plate. Multiple foci of zone plate, comparison between convex and concave lens, Fraunhofer diffraction by single slit and a circular aperture, diffraction by \( N \) parallel slits with two slits as a special case. Missing order, Plane wave diffracting grating and its use in determining wavelength, Dispersion by a grating, Rayleigh's criterion of resolution, Resolving power of a Telescope and a Grating.

Unit – 3 Polarization:

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double refraction and (iv) by dichroism (Polaroid), Identification of polarized light. Fresnel’s theory of double refraction. Production of Circularly and Elliptically Polarized light. Quarterwave and half wave plates. Analysis of polarized light, Optical activity. Law of Optical Activity, Fresnel’s explanation of optical activity, Experimental verification of Fresnel’s theory. Specific rotation, Polarisimeter, Types of Polarisimeter: (i) Laurent’s half shade polarimeter and (ii) Biquartz polarimeter.

Unit - 4: Quantum Optics & Photonics

(i) Laser: Spontaneous and stimulated emission, Einstein’s A & B coefficients, Energy density of radiation as a result of stimulated emission and absorption, population inversion, Methods of optical pumping, energy level schemes, He-Ne, Ruby, CO₂ lasers.
(ii) Holography: Basic concepts of Holography, principle of holography, Theory, construction and reconstruction of image, application of holography.
(iii) Fiber Optics: Introduction of Optical Fiber, Necessity of Cladding, Optical fiber system, optical fiber cable, Total internal Reflection, Explanation of Propagation of light through an optical fiber.

Reference:
1. Optics by Brij Lal & Subramanium, S. Chand.
2. Optics by D. P. Khandelwal.
Practical

Work Load: Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

The colleges are free to set new experiments of equivalent standard. This should be intimated and approved by the Convener, Board of Studies before the start of academic session. It is binding on the college to have experimental set up of at least sixteen experiments listed below (8 from each section). In case number of experiment performed by the student is less than sixteen, his marks shall be scaled down in final examination on pro rata basis. Laboratory examination paper will be set by the external examiner by making pairs of experiments taking one from each section out of sixteen or more experiments available at the center. Different combinations shall be given for different batch.

Section A

1. To study the variation of power transfer by two different loads by a DC source and to verify maximum power transfer theorem.
2. To study the variation of charge and current in a RC circuit with a different time constant (using a DC source).
3. To study the behavior of a RC circuit with varying resistance and capacitance using AC mains as a power source and also to determine the impedance and phase relations.
4. To study the rise and decay of current in an LR circuit with a source of constant emf.
5. To study the voltage and current behavior of an LR circuit with an AC power source. Also determine power factor, impedance and phase relations.
6. To study the characteristics of a semiconductor junction diode and determine forward and reverse resistances.
7. To study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph and hence find radius of the circular coil.
8. To determine the specific resistance of a material and determine difference between two small resistance using Carey Foster's Bridge.
9. To convert a galvanometer into a ammeter of a given range.
10. To convert a galvanometer into a voltmeter of a given range.

Section B

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.
3. To study the damping using compound pendulum.
To study the excitation of normal modes and measure frequency spectrum of two coupled oscillators.
5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.
6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.
7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
8. To find J by Callender and Barne's Method.
9. To determine Young's modulus by bending of beam.
10. To determine Y, σ and η by Searle's method.
11. To ensure Curie temperature of Monel alloy.
12. To determine modulus of rigidity of a wire using Maxwell's needle.
13. Study of normal modes of a coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
14. To study variation of surface tension with temperature using Jaeger's method.
15. To study the specific-rotation of sugar solution by polarimeter.
MATHEMATICS

B.Sc.-B.Ed. Part-I Examination-2020

Teaching: 3 Hours per Week per Theory Paper.
2 Hours per Week per Batch for Practical
(20 candidates in each batch)

<table>
<thead>
<tr>
<th>Examination Scheme:</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
<tr>
<td>Arts</td>
<td>72</td>
<td>200</td>
</tr>
</tbody>
</table>

| Paper – I Discrete Mathematics    | 3 hrs.          | 40 (Science) |
|                                   |                 | 53 (Arts)    |
| Paper – II Calculus               | 3 hrs.          | 40 (Science) |
|                                   |                 | 53 (Arts)    |
| Paper – III Analytic Geometry and Optimization Theory | 3 hrs. | 40 (Science) |
|                                   |                 | 54 (Arts)    |
| Practical Optimization Techniques | 2 hrs.          | 30 (Science) |
|                                   |                 | 40 (Arts)    |

Note:

1. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.

2. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.

3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates.

4. Each candidate has to pass in Theory and Practical examinations separately.

Paper – I: Discrete Mathematics

Teaching: 3 Hours per Week

Duration of Examination: 3 Hours

Max. Marks: 40 (Science)

53 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

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Jaipur
Unit 1: Sets, Cardinality, Principal of inclusion and exclusion, Mathematical induction, Relations and Functions, Binary relations, Equivalence relations and partitions, Partial order relations and lattices, Chains and Anti-chains. Pigeon hole principle.

Unit 2: Boolean Algebra- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices, Boolean Lattices, Boolean functions and Boolean expression. Fundamental theorem of arithmetic, Divisibility in $\mathbb{Z}$, Congruence's, Chinese reminder theorem, Euler's functions, Primitive roots.

Unit 3: Logic and propositional calculus, Simple and compound propositions, Basic logical operations, Truth tables, Tautologies and contradictions, Propositional functions, Quantifiers. Discrete numeric functions, Generating functions, Recurrence relations and Recurrence algorithms, Linear recurrence relation with constant coefficients and their solutions, Total solutions, Solution by the method of generating functions.

Unit 4: Basic concepts of graph theory, Types of graph (Connected Graphs, Regular graphs, Planar graphs), walk, Paths & Circuits, Shortest path problem. Operations on graphs (union, join, products)

Unit 5: Matrix representation of graphs, Adjacency matrices, Incidences matrices, Tree, Spanning tree, Minimum spanning tree, Distance between vertices, Center of tree, Binary tree, Rooted tree. Hamiltonian and Eulerian graphs

Reference Books:

5. N. Deo, Graph Theory, Prentice Hall of India, New Delhi, 2004.

Paper-II: Calculus

Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 40 (Science) 53 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.


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Unit 5: Areas, Rectification, Volumes and Surfaces of solids of revolution.

Reference Books:

Paper-III: Analytic Geometry and Optimization Theory

Teaching: 3 Hours per Week
Duration of Examination: 3 Hours

Max. Marks: 40 (Science)
54 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Polar equation of conics, Polar equation of tangent, normal and asymptotes, chord of contact, auxiliary circle, director circle of conics

Unit 2: Sphere, Cone.

Unit 3: Cylinder, Central Conicoids – Ellipsoid, Hyperboloid of one and two sheets, tangent lines and tangent planes, Direct sphere, Normals.

Unit 4: Generating lines of hyperboloid of one sheet and its properties. Reduction of a general equation of second degree in three-dimensions to standard forms.

Unit 5: The linear programming problem. Basic solution. Some basic properties and theorems on convex sets. Fundamental theorem of L.P.P. Theory of simplex method only

Duality. Fundamental theorem of duality, properties and elementary theorems on duality only.

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Reference Books:


Practical

Teaching: 2 hours per week per batch not more than 20 students

Examination:

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Science</th>
<th>Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Marks</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Min. Pass Marks</td>
<td>11</td>
<td>15</td>
</tr>
</tbody>
</table>

Distribution of Marks:

Two Practicals one from each group

- 10 Marks each = 20 Marks (13 Marks each) = 26
- 05 Marks
- 05 Marks
- 05 Marks

Total Marks = 30 Marks = 40

The paper will contain TWO practicals. The candidates are required to attempt both practicals.

Group A: Modelling of industrial and engineering problems into Assignment Problems and Transportation Problems and their solutions.

Group B: List of problems (with free and open source software tool Scilab)

(i) Plotting the graphs of the following functions: $ax, \sqrt{ax+b}, |ax+b|, c+|ax+b|, x^a, x^b (n \in \mathbb{Z})$, $e^{ax+b}$, $\log(ax+b), \sin(ax+b), \cos(ax+b), |\sin(ax+b)|, |\cos(ax+b)|$. Observe and discuss the effects of change in the real constant $a$, $b$ and $c$ on the graphs.

(ii) Graphs of hyperbolic functions and inverse trigonometric functions.

(iii) Plotting and analyzing the graphs of polynomials and their derivatives.

(iv) Complex numbers: Operations like addition, subtraction, multiplication, division, Modulus and inbuilt functions conj, imag, imult, isreal, real.

(v) Matrix operations: Addition, Multiplication, Inverse, Transpose, Determinant, Rank and inbuilt functions eye, ones, zeros. Solving the system of linear equations.

(vi) Solution of linear programming problems by using inbuilt functions of Scilab.

Note:

1. For Group A: Problems will be solved by using Scientific Calculators (non-Programmable)
2. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
3. Each Candidate has to pass in Practical and Theory examination separately.

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